Tech Sheet

‘Correct Diesel Tuning’

Well, Well....Diesel tuning is more important than we think. Lets get back to the basics.

Diesel is an oil. Oil as we know does not ignite easily if it is left as a liquid. If we atomise it though, it will burn readily, if a little smoky. The diesel principle relies on the air being compressed to high pressure in order to heat the air as diesels don't have igniters such as a spark plugs. Keep in mind, the glow plug only glows on cold start-up to warm up the air in the combustion chamber. A bit like when you are pumping up a push bike tyre, the pump gets warm. Ok, so you now have very hot air and you inject diesel in through a poor spraying injector. Because it is not atomising the diesel enough, the fuel volume burns erratically and slowly as the flame burns through the large droplets of oily fuel. If you were to light up a drum of oil, you would see a similar effect of slow burning and smoke. You can imagine that by now the timing of the combustion process is also upset. Throw in an injector that is spraying at a lower pressure than normal, due to age, and you have the timing of the fuel ignition point changing even more. The injectors doing this alone can make a diesel smoky
and sluggish. Throw in a cold morning and the combustion is even further retarded due to cold cylinders and cool combustion.

So, throw the scenario into a correctly set up injector. Remember the drum of oil? Well, if you could fill the drum with a misty vapour of oil and light it up, you would not only get a large bang but it would be over within a flash. So now, as the good injector sprays fuel out as a mist, the fuel burns rapidly and relatively clean as the droplets are so small that they burn with a puff! The injectors pressure is also now on spec so the spray is even more fierce and timed.

Now, the injectors are perfect but the injection pump could be slightly out of tune. Timing has to be set. If it is too early the vehicle can smoke and become quite ‘diesel noisy’ and if it is too late, the vehicle can feel sluggish. Imagine the spray of fuel as a fist about to hit the piston. If it is hit to far before top dead centre it would not only hurt your fist and the piston but it would make a louder than normal bang as the two things hit head on. If the piston had gone past top dead centre and was hit, the force of the hit would be going down with the piston so you would have too little impact on it. So you can see why timing is critical for maximum hit effect! Other things need to be checked like the fuel volume delivered by the pump. Too much is power but with smoke, too little is low power with absolutely NO smoke and just right is on the verge of no smoke, to is it or isn't it smoke! There are a few more complex settings on the pump that are checked and adjusted but these are the main ones.

Now to add to all this, lets run through it quickly. Ok, there are 6 injectors supplying fuel to the engine. Imagining it being a 6 cylinder diesel. Looks like it has no problems getting fuel. What about the important part that we forgot about, AIR? Well...it has to draw the air through a maze. Filter, pipes, inlet manifold and a tiny valve. This has to happen in a split of a second and the piston

going down has to do all the sucking. That's the governing part of a diesel engines performance. Remember more fuel for more power is just more smoke! So we have to do something about the air to keep things clean. This is where a Turbo system comes into its' own with Diesel engines. With a huge amount of air now available due to the turbo supplying air right to the inlet valve, the piston only has to suck air from there. Lets not forget that 1 cylinder has a suction stroke many times a second, so these fallacies of air being forced into the engine and blowing heads off are only that! Now that we have more air, the fuel system can be set up according for more power. **WARNING-** This is where the whole equation can come adrift with overheating etc. Things have to be set up by a professional and a professional that knows his JOB! I have personally fitted every turbo system here for the last 16 years and if it is done correctly there are NO troubles!!

One last major note. The diesel system that is on all 4WD diesels was designed to run on a fuel with certain burning characteristics. We don't seem to be getting fuel out here in Australia meeting all these requirements. We have new vehicles smoking that obviously are not designed to smoke when running on real diesel. So when we, here at Berrima Diesel, are setting up a fuel injection system for tuning, we have to take the burning characteristics of this poor diesel into consideration. Try to get
your fuel from a reputable and 'known brand' garage and keep your receipts. If you have problems, you have as much 'come-back' on the garage as you have with a faulty product from a shop.

Safe 4WDriving,
Andrew Leimroth

Footnote: The modern diesel has come a long way from its beginnings!! Well…so we are all lead to believe!! That's where it all stops. In fact about the only thing that could compare is reinventing the round wheel!! That's right. Nothing has really changed. A diesel still needs fuel and air. Even though we now have trendy things like 'Common-rail High Pressure Injection and Electronics controlling everything, it is still the same old principle. The only major change appears to be the repair costs… as usual. Most 'high tech' injectors now cost over $2000 each and are 'throw away'. Most Injector pumps are becoming 'throw away' at around $6500. Where will it end!!